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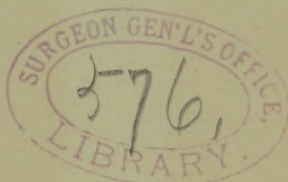
ARSENICAL NEURITIS, WITH THE RE-  
PORT OF A CASE OCCURRING IN  
A LAD OF FIVE YEARS.

By ALFRED STENGEL, M.D.,

Physician to the Children's Hospital, of Philadelphia; Instructor  
in Clinical Medicine, University of Pennsylvania.

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# ARSENICAL NEURITIS, WITH THE REPORT OF A CASE OCCURRING IN A LAD OF FIVE YEARS.\*

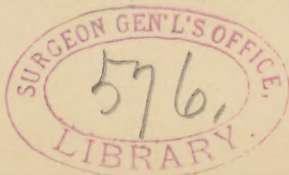
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Paralysis has long been recognized as one of the symptoms of arsenical intoxication, but opinions have varied as to the pathological lesions concerned. The oldest view was that the morbid changes involve the spinal cord, mainly or exclusively; and it seems somewhat probable that changes may occasionally occur in the cord. The more important lesion, however, is found in the peripheral nerves, and in the great majority of cases neuritis is probably the exclusive lesion. This fact was first conclusively demonstrated by Jaeschke. The peripheral nerves of the extremities, and especially those of the legs are most frequently involved. Very often arms and legs are simultaneously affected, and in most instances the disease is symmetrical on the two sides of the body. Exceptionally other parts of the body are involved. The palsy may be purely motor, but is more frequently sensory as well. The onset is attended with pains in the limbs or other parts, and sometimes with distinct rheumatoid pains in the joints. Later weakness of the muscles develops and finally more or less complete paralysis with atrophy, reactions of degeneration, and loss of reflexes are observed. Exceptionally the reflexes are preserved, and they may indeed be exaggerated. In the stage of full development of the disease pain, as a rule, gives place to paræsthesia and anæsthesia, the latter being frequently irregularly distributed. In some cases, however, as has already been stated, sensory symptoms are wanting, the disease being purely motor in nature.

Arsenical neuritis may follow accidental poisoning due to contamination of the air with dust from carpets, curtains, wall-paper, and other articles colored with arsenic dyes, or it may be caused by single large doses of the drug taken accidentally, or with intent at suicide. Arsenic eaters appear to suffer infrequently when the amounts of the poison consumed are con-

\* Read before the Philadelphia Pediatric Society, January 12, 1897.



sidered. Intoxication is comparatively seldom the result of medicinal use of the remedy. I have seen several cases in which more or less pronounced symptoms followed the administration of large doses in cases of Hodgkins disease and leukaemia, and now report an instance occurring in a young boy who suffered with chorea, for which Fowler's solution was administered.

Bartie C., aet. five years.

*Family History.*—Paternal grandfather was said to have had rheumatism, probably muscular. No family history of chorea or neuroses.

*Previous History.*—Had convulsions while teething; never had scarlatina, but whooping cough, and in February, 1896, typhoid fever followed by cervical adenitis; was never strong after this time. There is no history of rheumatism. The child has always been of a neurotic temperament.

He was admitted to the out-patient department of Dr. Morris J. Lewis, at the Orthopædic Hospital on July 29, 1896, suffering with chorea. This was the first attack and had begun two weeks before without any discoverable cause. The order in which the members were affected was the following: left arm, left foot and leg, then speech became thick and incoördinate, finally the right side, very slightly.

*On admission* it was noted that the general aspect was choreic, digestion was good, appetite fair, bowels regular, sleep good and intelligence good. He was irritable in temper. There was a systolic murmur at the apex, not transmitted, and a similar murmur over the base of the heart. The reflexes were increased on the right side, not on the left. Left side paretic, but moved slightly. On the right side there were constant choreic movements, increased by volitional efforts, but quiet during sleep. There was no tenderness over the spine. He was given Fowler's solution in increasing doses, beginning with three drops three times daily.

On August 5th, the note reads: Improved, taking five drops three times daily. To come into house.

On August 20th, it was noted that he was very much quieter. Took as much as ten drops of Fowler's solution three times daily, when toxic symptoms appeared and the drug was discontinued. He was discharged on September 3d, practically well.

On September 9th, it is noted that he had been in the house until the week before. He was much improved, having little or no twitching. He did not use right foot properly. The same cardiac murmurs were heard as previously and also a venous bruit in the neck. He was ordered five drops of the tincture of the chloride of iron, three times a day.

On September 23d, it was noted that he dragged and threw his feet in a way suggestive of poliomyelitis or neuritis. Knee jerks active. He cries at times on account of pain in the legs.

The patient was admitted to my ward at the Children's Hospital on September 28, 1896, when the following facts were obtained: The choreic movements had ceased rather abruptly and the patient had been taken home from the Orthopædic Hospital, practically well. After a couple of weeks, however, he began to have a staggering gait and would frequently fall. This grew in severity until he was not able to walk without great difficulty.

On October 1st, it was noted that his station was poor and his gait extremely tottering or ataxic. Sensation was good, the knee jerks exaggerated, no ankle clonus. No pain or tenderness, slight atrophy of the legs.

During the next two months the patient improved somewhat in his ability to walk and stand, but otherwise there was little change.

On December 4th, it is noted that the choreic movements were returning. The gait and station were little changed. He was ordered quinine in ascending doses.

During the next week the chorea continued much the same, though quinine was given very freely. He was then given bromide of potash and began to grow more quiet.

On January 5, 1897, it was noted that the chorea had improved very greatly. He still had a decidedly tottering gait and poor station. The electrical reactions could be tested only with the faradic current. No response was obtained in the extensors of the legs and feet and only a slight contraction in the quadriceps. The intrinsic flexors of the foot responded distinctly though feebly, the flexors of the leg very little, and those of the thigh scarcely any more. The gluteal group and the abdominal muscles acted strongly.

There is total preservation of sensation, and the skin reflexes (plantar, cremasteric or abdominal), are active. The knee jerks are preserved and active. At times they seem to be decidedly exaggerated. There is some improvement in his gait. There is some atrophy of the legs, particularly the right.

This case presents a number of points of interest to which I shall allude. Though the case permits of a certain amount of doubt as to the diagnosis, I am myself convinced that it is one of arsenical neuritis. It is necessary, however, to consider other possible affections. The onset of the disease appears to have been rather rapid, if not abrupt, and the symptoms grew in severity from day to day. There had been previous symptoms of arsenical intoxication of unmistakable character, the paralysis following after an interval of a week or more. The fact that such an

interval existed does not preclude the possibility of arsenical neuritis; indeed, this has been quite commonly observed in reported cases. As a rule, this interval is quite as long, or longer, than that which occurred in my patient; and sometimes the onset of the palsy is delayed for very considerable periods of time. There were some sensory manifestations in the beginning, though the history records no details beyond complaint of pain in the legs. Subsequently sensory manifestations were entirely wanting. The absence of anæsthesia is of considerable moment, as some writers have held this to be one of the invariable symptoms. Gerhardt, however, long ago reported cases in which objective disorders of sensibility have been wholly, or almost wholly wanting, and in the case of Putnam, and the recent one of Comby, there was complete absence of anæsthesia.

The disease which is to be distinguished or excluded with the greatest care is acute anterior poliomyelitis. Among the conditions which favor this diagnosis are the complete preservation of sensation in the skin, and the persistence of the paralysis. As far as the former symptom is concerned, enough has been said to show that it does not exclude neuritis due to arsenic. As for the latter, it may be said that cases of chronic character, running through a period of many months, or even years, and indeed persistent paralysis, may follow the medicinal use of the drug. This, however, would be unlikely in a case such as mine, in which relatively small amounts were given. The dose (ten drops) was perhaps a large one for a child of five years, but the remedy was continued only thirty days, during which the total amount given was less than one fluid ounce. Despite the points spoken of as more significant of poliomyelitis, the weight of the evidence points to neuritis. Among the more important symptoms in this direction are: The almost completely symmetrical character of the paralysis; the absence of decided wasting; the preservation of reflexes, which would almost certainly be lost in infantile palsy; the distinctly tottering and ataxic gait, and the disturbance of station.

It is scarcely necessary to consider other diseases which occasion paraplegia, such as myelitis and diseases of the membranes of the cord.

The occurrence of this accident during the administration of arsenic for medicinal purposes is of great importance. All authors who have had large experience in the use of arsenic in

nervous diseases, skin diseases, and other conditions in which the drug is given in large doses, and for long periods, agree that neuritis is a rare accident. Dr. Morris Lewis has told me that he had never before met with a case in his service at the Orthopædic Hospital, and does not recall a case in the service of his colleagues. Practically the same experience is reported by one of the chiefs of a large nervous clinic in New York (personal communication to Pellew, Hamilton's System of Legal Medicine). This gentleman met with but two cases among several hundred patients, who received full doses of the drug. Finally a review of the literature illustrates the rarity of this accident, very few observers having reported more than a single case or a few cases. The reported cases further illustrate the fact that the symptoms not rarely occur most unexpectedly, and even after the remedy has been discontinued. This suggests the thought that there may be a cumulative action. While there is no positive proof that such cumulation does occur in the sense of a complete storing up of the arsenic, it is likely that the amount in the system increases greatly as the administration is continued. This results from the slow elimination of the remedy, and perhaps, in certain cases, to inadequate renal activity. Sometimes premonitory symptoms may give a sufficient warning of danger, as in the case of Gourbeyre, in which rheumatoid pains occurred after fifteen days, the patient taking two drops at a dose. More frequently there is no warning of the nervous complication, but only the usual gastro-intestinal disturbances indicative of toxic action.

It is of some importance to study the question of susceptibility, and the size of the dose which may possibly cause neuritis. Some patients tolerate enormous doses without untoward results. I have repeatedly given twenty drops three times daily for weeks, in pernicious anæmia and leukæmia, without provoking more than the ordinary gastro-intestinal symptoms. In several cases I have given even larger amounts, one recently under my care taking as much as forty or sixty drops three times daily. Sometimes, however, it is soon apparent that the remedy is not well borne, and in these I have always reduced the amount administered to a safe quantity. The case now reported, however, shows that such a rule will not always suffice to obviate serious results. In the child presented to the Society there had been no definite toxic signs until August 20, 1896, and the

remedy was immediately discontinued. In spite of this precaution, however, the nervous complication occurred, and was doubtless brought to its full development by the arsenic still remaining in the system when the administration was stopped.

No useful deductions regarding the dose can be drawn from a study of the reported cases. In that of Gourbeyre, suggestive symptoms occurred when but six drops of Fowler's solution were given daily; in one reported by Gaillard, extensive paralysis followed the administration of fifteen drops four times daily; in one of Dana, the dose was thirty drops three times a day when symptoms began. Other cases might be cited, but these illustrate the variability even among the cases in which moderate medicinal use of the remedy has been followed by paralysis. No comparisons can be made between the activity or toxicity of arsenious acid and the arsenites, though it is certain that the former is less dangerous, though for the same reasons no doubt less effective as a remedy.

In conclusion, it may be held that there is some reason for believing that elimination rarely keeps pace with the administration when moderate or large doses are given. As a practical measure of safety, it is therefore advisable to discontinue the remedy from time to time for periods of a week or two.

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